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EL NINO AND GLOBAL CLIMATIC IMPACTS

CLIMATE ANALYSIS CENTER

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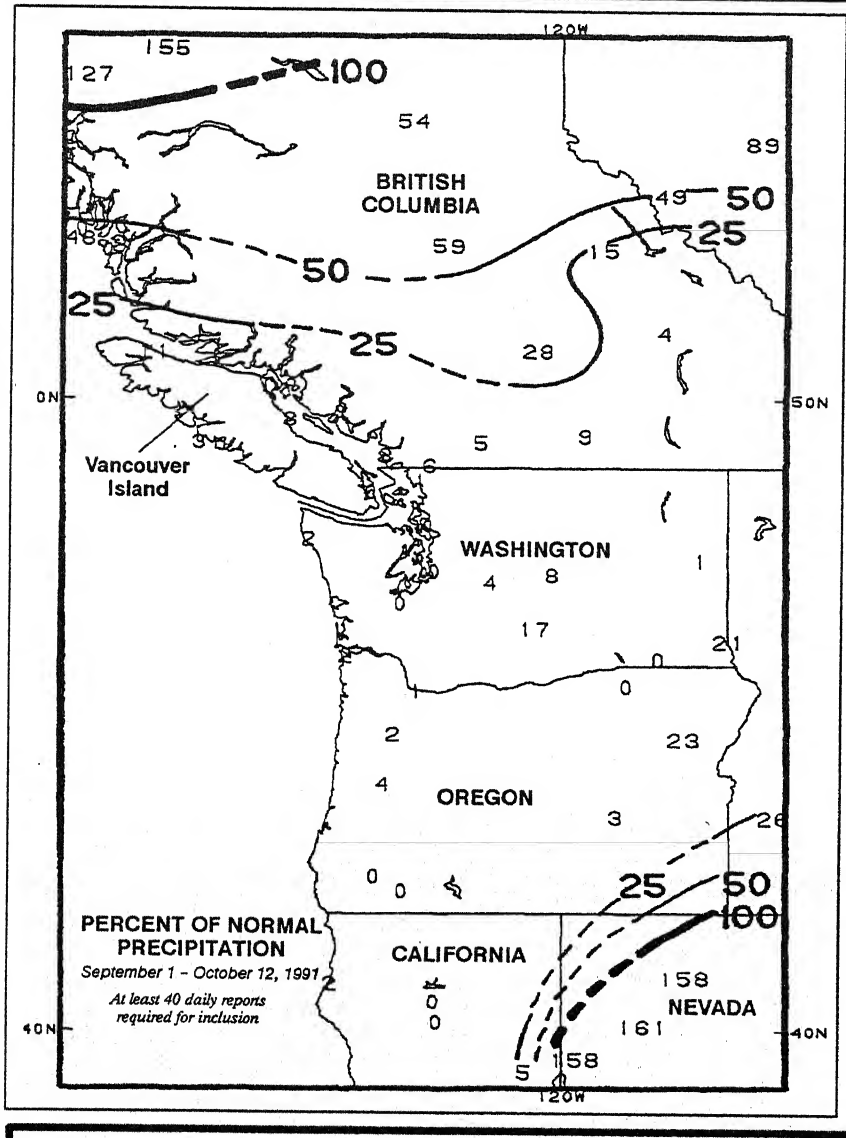
EL NINO SOUTHERN OSCILLATION ADVISORY #91/06

WEEKLY CLIMATE BULLETIN

No. 91/41 **Washington, DC** **October 12, 1991**



The 1991 - 1992 rainy season has gotten off to a very slow start in the Pacific Northwest. Little or no precipitation has fallen since the first of September, representing less than 25% of normal precipitation across Washington, Oregon, and southern British Columbia. Moisture deficits over ten inches have accumulated on Vancouver Island and the Olympic peninsula while shortfalls ranged from two to seven inches across western Oregon and Washington. Precipitation normals during this period are still rather low in eastern sections of Washington and Oregon and through interior California, where little or no precipitation resulted in deficits of 0.7 to 1.6 inches

UNITED STATES DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE-NATIONAL METEOROLOGICAL CENTER
CLIMATE ANALYSIS CENTER

WEEKLY CLIMATE BULLETIN

This Bulletin is issued weekly by the Climate Analysis Center and is designed to indicate, in a brief concise format, current surface climatic conditions in the United States and around the world. The Bulletin contains:

- *Highlights of major climatic events and anomalies.*
- *U.S. climatic conditions for the previous week.*
- *U.S. apparent temperatures (summer) or wind chill (winter).*
- *Global two–week temperature anomalies.*
- *Global four–week precipitation anomalies.*
- *Global monthly temperature and precipitation anomalies.*
- *Global three–month precipitation anomalies (once a month).*
- *Global twelve–month precipitation anomalies (every three months).*
- *Global three–month temperature anomalies for winter and summer seasons.*
- *Special climate summaries, explanations, etc. (as appropriate).*

Most analyses contained in this Bulletin are based on preliminary, unchecked data received at the Climate Analysis Center via the Global Telecommunications System. Similar analyses based on final, checked data are likely to differ to some extent from those presented here.

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GLOBAL CLIMATE HIGHLIGHTS

MAJOR CLIMATIC EVENTS AND ANOMALIES AS OF OCTOBER 12, 1991

1. Western North America:

ABNORMALLY WARM AND DRY CONDITIONS PERSIST.

Less than 10 mm of precipitation were again recorded throughout the region, allowing moisture deficits to continue growing. Since early September, shortfalls of 50–100 mm have accumulated in western sections of Oregon, Washington, and British Columbia, with deficits reaching 265 mm along the immediate northwestern Washington coast and on Vancouver Island [6 weeks]. In addition, exceptionally mild weather remained entrenched throughout the region for a fourth consecutive week (see U.S. Figure 1). Weekly departures of +3°C to +7°C were widespread except along the immediate Pacific coast and in southeastern Washington. The Los Angeles Civic Center recorded its highest temperature of 1991 on October 11, when the mercury soared to 42°C [4 weeks].

2. Central North America:

SOMEWHAT MILDER WEATHER PREVAILS.

Weekly temperatures returned to within 2°C of normal, with above normal temperatures invading the western and northern fringes of the region [Ended after 4 weeks].

3. New England and the Maritime Provinces:

ABOVE NORMAL PRECIPITATION MEASURED.

Since early September, unspectacular but persistently above normal rainfall totals have been reported throughout the region. Most locations observed 50–75 mm more than normal amounts during the period, with some 75–150 mm surpluses recorded in interior New England and along the southeastern coasts of Nova Scotia and Newfoundland. Last week, 40–80 mm of precipitation soaked all but extreme southern New England [5 weeks].

4. Eastern Europe and Western Siberia:

ANOTHER WARM WEEK.

Weekly departures of +3°C to +7°C affected north-central Africa and a large area from Switzerland northward into Scandinavia and eastward into western Siberia [11 weeks].

5. Taiwan, the Ryukyus, and Southern Japan

TYPHOON ORCHID INUNDATES PARTS OF JAPAN WHILE MUCH DRIER WEATHER IS OBSERVED FARTHER SOUTHWEST.

Typhoon Orchid missed Japan, passing 300 km to the southeast of Tokyo, but torrential cloudbursts associated with the storm dumped 150–400 mm throughout the southeastern third of Honshu. Hachijo-Jima, an island located 300 km south of Tokyo, recorded 655 mm of rain during the week, raising the island's six-week rainfall surplus to 830 mm. On Honshu, 200–590 mm more than normal rainfall has been measured during the period. Fortunately, a much drier week was observed across Taiwan, where little or no rain fell, as well as along the Ryukyus and across Shikoku, Kyushu, and extreme western Honshu, where most locations measured 10–35 mm [5 weeks].

6. Indonesia:

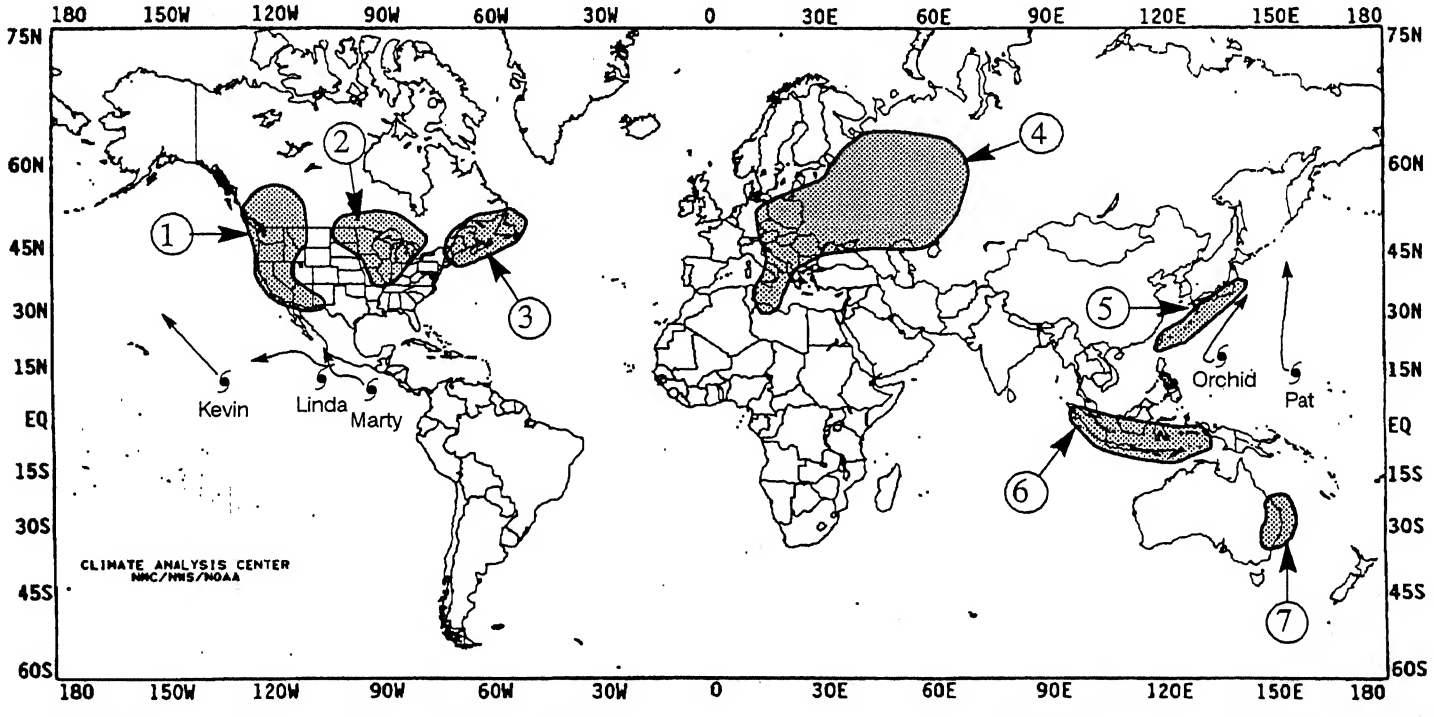
CONTINUING DRYNESS ENGENDERS LARGE WILDFIRES.

Moderate rains (40–100 mm) fell on scattered locations across Sumatra, western Borneo, the central Molukus, and western Irian Jaya while most areas received little or none. During September 1 – October 12, 1991, much of the Molukus, Celebes, western Java, and Sumatra received 120–340 mm below normal rainfall, and most locations throughout the nation recorded less than 25% of normal (see page 6). The exceptionally dry conditions have engendered ideal conditions for large wildfires, which have burned over 1000 km^2 of drought-stricken jungle on Borneo. The fires have spread a thick shroud of dingy haze across the western half of the nation that has interfered with air, sea, and river navigation by dropping visibilities below 50 m at times, according to press reports. Government officials announced recently that Indonesia would begin importing grain for the first time since 1984 due to an expected drought-induced drop in yields [6 weeks].

7. Eastern Australia:

VERY LOW RAINFALL TOTALS AGAIN REPORTED.

An isolated location along the east-central Australian coast (Coffs Harbour) reported nearly 105 mm of rain, all of which fell in one day, but exceptionally dry conditions were again observed elsewhere. Fewer than 10 mm were measured throughout the afflicted region, allowing moisture shortages to increase. Since early September, 55–110 mm shortfalls accumulated across the typically wetter southern and eastern sections of the region as most areas received below 30% of normal rainfall [11 weeks].



EXPLANATION

TEXT: Approximate duration of anomalies is in brackets. Precipitation amounts and temperature departures are this week's values.

MAP: Approximate locations of major anomalies and episodic events are shown. See other maps in this Bulletin for current two week temperature anomalies, four week precipitation anomalies, long-term anomalies, and other details.

UNITED STATES WEEKLY CLIMATE HIGHLIGHTS

FOR THE WEEK OF OCTOBER 6 – 12, 1991

Torrential rains bombarded Florida for the second consecutive week. Slow–moving thunderstorms dumped several inches of rain in southeast Florida, causing widespread flooding of homes, forcing evacuations. Water up to 3 feet deep covered roads in Hollywood, FL where up to 15.5 inches of rain was measured, including 11 inches that fell in an 8 hour period on Tuesday. Nearly two dozen residents evacuated a trailer park in northern Dade County due to rising floodwaters, according to press reports. Extensive flooding was also reported along U.S. Highway 1. The rains proved to be beneficial to the Everglades however, providing needed moisture after 3 consecutive years of dry weather. Elsewhere, hot and relatively dry conditions dominated the Great Plains, Rockies, and Far West. Over 50 record daily highs were set from Texas to Washington with readings topping the century mark in southern Texas and California. The Civic Center in downtown Los Angeles observed a record daily high of 107°F on Thursday and Winnemucca, NV reported a high of 88°F on Friday, the highest temperature ever recorded so late in the year. In contrast, unseasonably cold weather affected much of the eastern U.S., with freezing temperatures dipping as far south as Georgia. Numerous record daily lows were reported from North Dakota, where readings dropped into the teens, to northern Florida. A low of 35°F at Montgomery, AL on Tuesday morning, was the lowest temperature ever recorded so early in autumn. In Alaska, heavy rains soaked the southeast while bitter cold afflicted the extreme north. Nearly 7 inches of rain was measured at Annette Island while farther north temperatures plunged to –7°F at Anaktuvuk Pass.

The week began with heavy rain in northern New England, light snow in the Great Lakes, and relatively dry weather across the remainder of the lower 48 states. Showers and thunderstorms associated with a cold front doused parts of New Hampshire, Vermont, and Maine. To the west, wintry weather affected the upper Midwest and Great Lakes as light snow fell across Michigan. Unseasonably cold weather spilled rapidly southward out of Canada, chilling a large portion of the eastern U.S. Over two dozen record daily lows were reported from the northern Plains to the Deep South with lows dipping into the thirties as far south as northern Florida. In contrast, unusually warm conditions prevailed from the central Plains westward. Record daily highs were established from Kansas to Nevada as readings soared above 90°F. In Florida, a stalled cold front draped over the [illegible] of the state spawned strong thunderstorms, packing [illegible]. Amounts between 3 and 7 inches were common [illegible] parts of Dade and Broward counties with nearly a foot of precipitation measured at some locations. Flooding was reported from Pompano Beach to Miami.

In the last half of the week, more heavy rain soaked southern Florida, pushing weekly totals over 12 inches in Miami and Hollywood, FL. Flooding persisted into Thursday, leaving some locations under waist high water. Elsewhere, record heat continued to bake the western half of the nation. Readings topping 90°F were common from Texas to Oregon as nearly two dozen record daily highs were established Thursday. Phoenix, AZ reached the century mark for the 10th time in October when the mercury hit a high of 105°F on Thursday. Farther east, a cold front front trekked across the East, spawning thunderstorms in the mid–Atlantic.

According to the River Forecast Centers, the greatest weekly totals (more than 2 inches) were confined to southeastern Florida, northern New England, and southeastern and south–central Alaska (Table 1). Light to moderate amounts were measured across the Great Lakes, eastern Ohio Valley, coastal North Carolina, west–central and extreme southwest Alaska, eastern Hawaii, and the remainders of New England and southeast Alaska. Little or no precipitation occurred in the Southeast and the remainder of the conterminous U.S. from the Midwest to the West Coast.

Abnormally warm weather prevailed in southern Florida, northern Maine, and west of the eastern Great Plains (Table 2). Weekly departures of +9°F and +13°F were observed across California, Nevada, Arizona, and the northern Rockies. Departures of +3°F to +8°F were prevalent from the eastern Great Plains to the West Coast. Near to slightly above normal temperatures were limited from north–central Texas to northeast Oklahoma, and across southern Florida, northern Maine, and the Hawaiian Islands. In Alaska, unusually mild weather was confined to extreme southeastern and west–central sections with weekly departures between +2°F and +4°F.

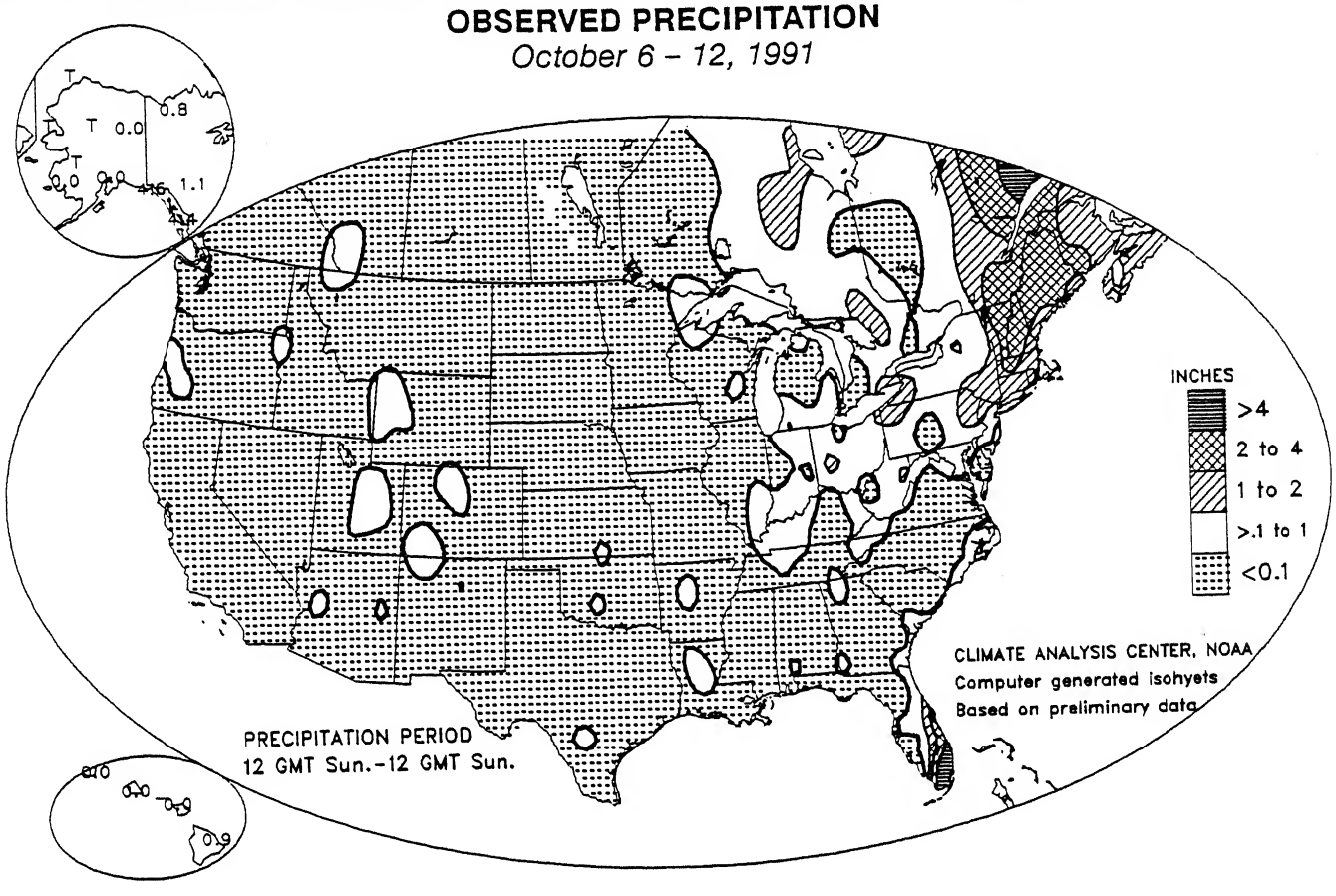
Unseasonably cold conditions gripped the eastern half of the nation and the southern half of Texas (Table 3). Weekly departures of –7°F to –10°F dominated from the central Gulf Coast northward to the central Appalachians. Temperatures averaged between –2°F and –6°F below normal across the Midwest, most of the Mississippi Valley, Great Lakes, southern Texas, and the remainders of the Atlantic Coast and Northeast. Near to slightly below normal temperatures were experienced across the remainder of the Mississippi Valley and central Texas. Cooler than normal conditions affected most of Alaska. Weekly departures between –2°F and –5°F covered a large portion of the state from the southwest to the northeast.

SELECTED STATIONS WITH 2.00 OR MORE INCHES OF PRECIPITATION DURING THE WEEK OF OCTOBER 6 – 12, 1991

	TOTAL (INCHES)	STATION	TOTAL (INCHES)
	13.50	BURLINGTON, VT	2.50
	8.21	BANGOR, ME	2.25
	6.81	RUMFORD, ME	2.20
	4.56	HOULTON, ME	2.15
	3.72	CARIBOU, ME	2.14
	3.51	JUNEAU, AK	2.12
	3.31	WEST PALM BEACH, FL	2.08
	2.97	CONCORD, NH	2.08
FL	2.79	AUGUSTA, ME	2.00
	2.52		

OBSERVED PRECIPITATION

October 6 – 12, 1991



DEPARTURE OF AVERAGE TEMPERATURE FROM NORMAL (°F)

October 6 – 12, 1991

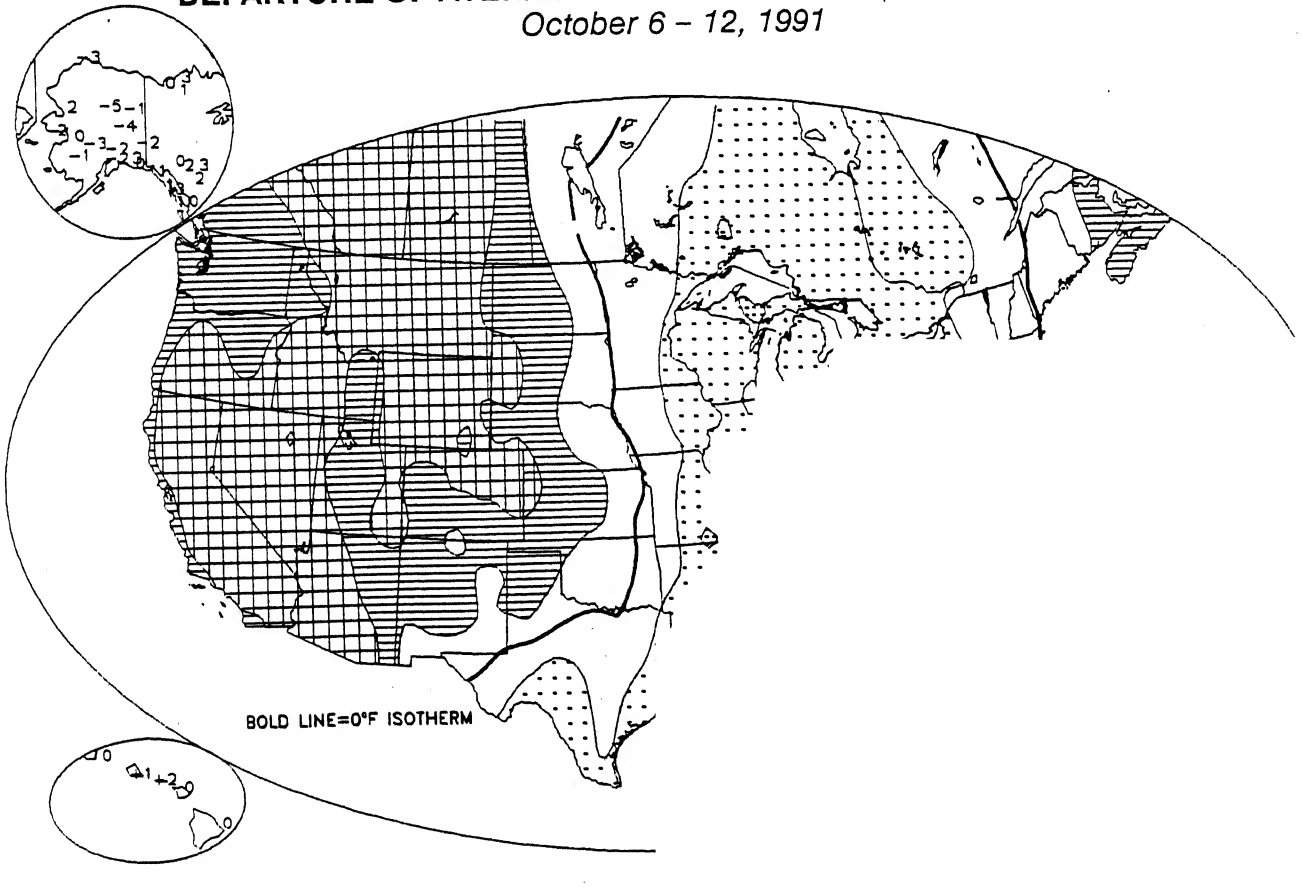


TABLE 2. *SELECTED STATIONS WITH TEMPERATURES AVERAGING 9.5°F OR MORE ABOVE NORMAL FOR THE WEEK OF OCTOBER 6 - 12, 1991*

STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
VICTORVILLE/GEORGE AFB, CA	+13.2	77.1	LOVELOCK, NV	+10.7	65.7
SEXTON SUMMIT, OR	+13.2	66.4	RED BLUFF, CA	+10.5	78.3
SAN BERNARDINO/NORTON AFB,CA	+12.8	79.9	TUCSON/DAVIS-MONTHAN AFB, AZ	+10.2	82.1
BURBANK/HOLLYWOOD, CA	+12.6	79.9	SHERIDAN, WY	+10.1	60.1
YUMA, AZ	+12.0	91.2	PASO ROBLES, CA	+10.0	74.2
PHOENIX, AZ	+11.9	88.3	MT SHASTA, CA	+10.0	63.9
BLUE CANYON, CA	+11.9	68.4	TONOPAH, NV	+9.9	65.7
CUT BANK, MT	+11.9	58.5	LAS VEGAS, NV	+9.8	80.7
RENO, NV	+11.6	64.3	STAMPEDE PASS, WA	+9.6	54.2
GREAT FALLS, MT	+10.8	61.7	MEDFORD, OR	+9.5	66.3
GLENDALE/LUKE AFB, AZ	+10.7	84.6			

TABLE 3. *SELECTED STATIONS WITH TEMPERATURES AVERAGING 7.0°F OR MORE BELOW NORMAL FOR THE WEEK OF OCTOBER 6 - 12, 1991*

STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
CROSSVILLE, TN	-9.7	49.9	BIRMINGHAM, AL	-7.5	57.7
ANNISTON, AL	-8.1	56.8	MONTGOMERY, AL	-7.5	60.5
PARKERSBURG/WOOD CO, WV	-8.0	50.5	AKRON, OH	-7.4	47.9
CHATTANOOGA, TN	-8.0	54.9	ASHEVILLE, NC	-7.4	51.2
HUNTSVILLE, AL	-8.0	56.0	LEXINGTON, KY	-7.3	52.4
ROME, GA	-7.9	55.9	ALBANY, GA	-7.3	63.8
BRISTOL, TN	-7.8	51.9	ANDERSON, SC	-7.2	57.4
ELKINS, WV	-7.6	47.1	ESCENABA, MI	-7.1	43.0
KNOXVILLE, TN	-7.6	54.8	HUNTINGTON, WV	-7.1	52.2
NASHVILLE, TN	-7.6	55.6	TUSCALOOSA, AL	-7.0	59.5
MUSCLE SHOALS, AL	-7.5	56.6	CROSS CITY, FL	-7.0	68.8

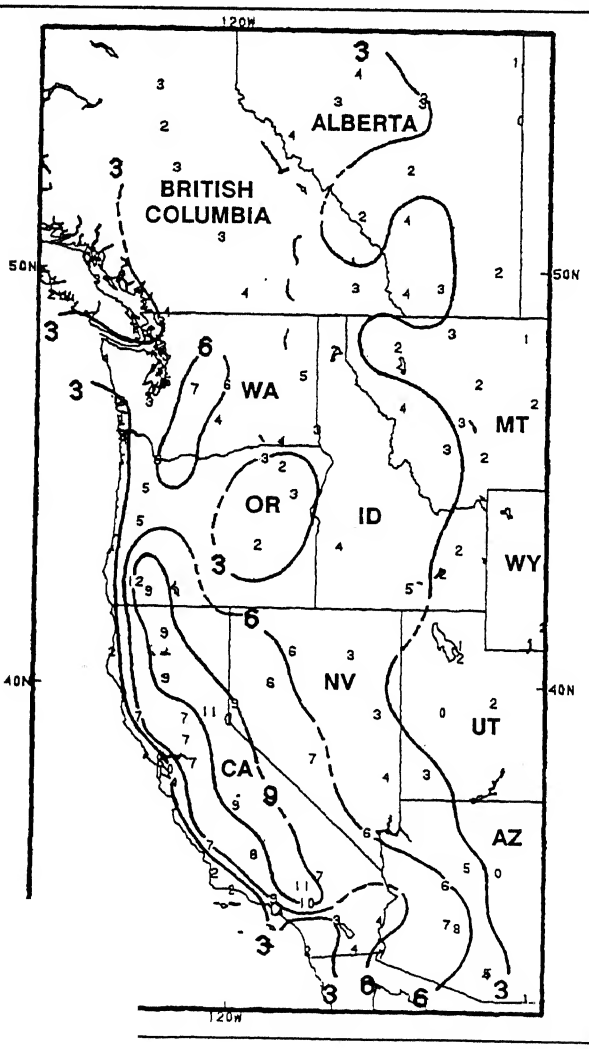
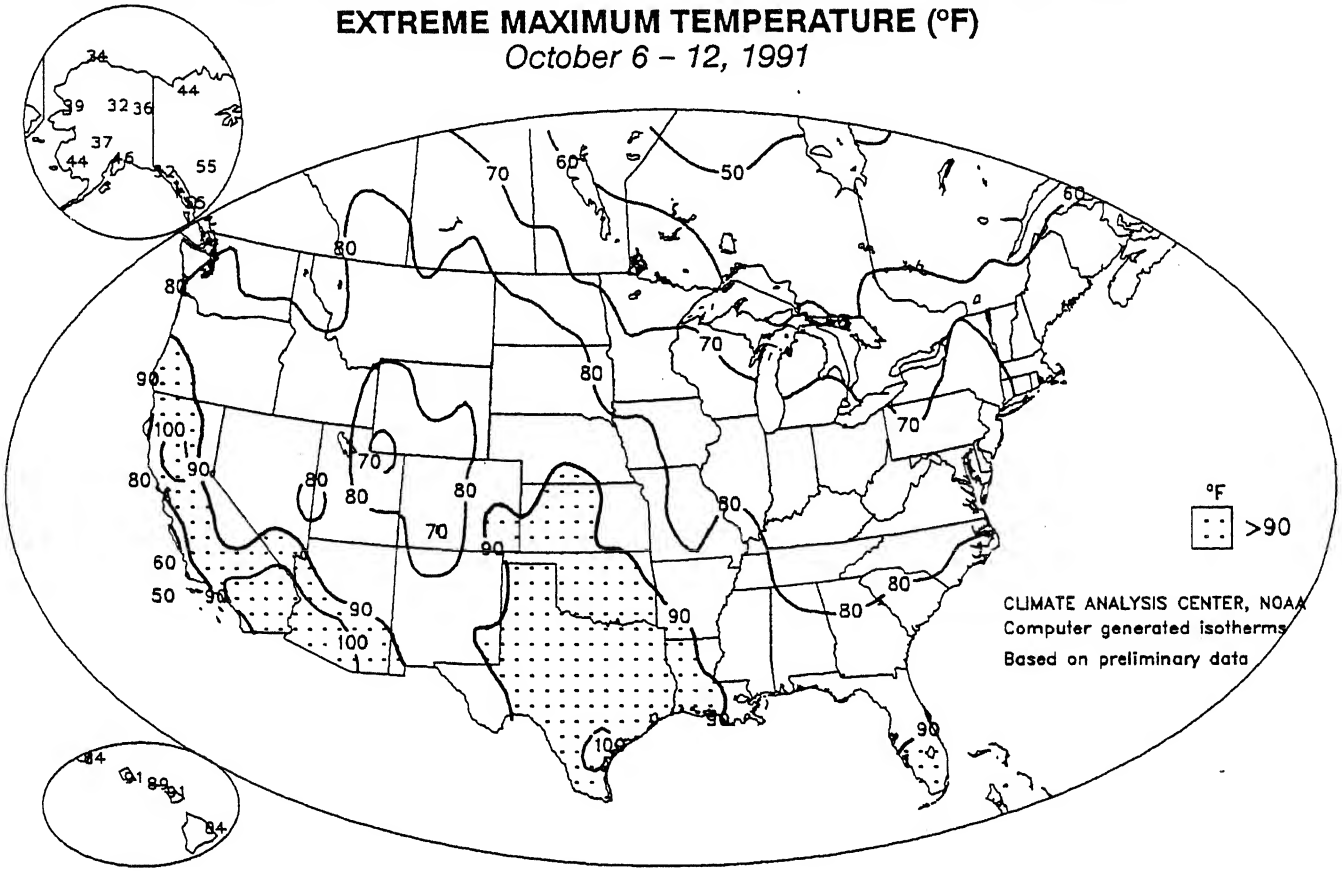


FIGURE 1. Departure from normal Temperature September 15 - October 12, 1991. *Isopleths drawn only for +3°F, +6°F, and +9°F. Abnormally warm weather has become entrenched in the Far West since mid-September. During the past four weeks departures exceeded +3°F everywhere but along the immediate Pacific Coast. The unseasonable high temperatures averaged over 9°F above normal in interior California and southwestern Oregon, aggravating the recent dryness, and creating conditions conducive for wild fires. The autumn heat wave pushed temperatures to 107°F at the Civic Center in Los Angeles, CA on October 11, the location's hottest day of the year.*

EXTREME MAXIMUM TEMPERATURE (°F)

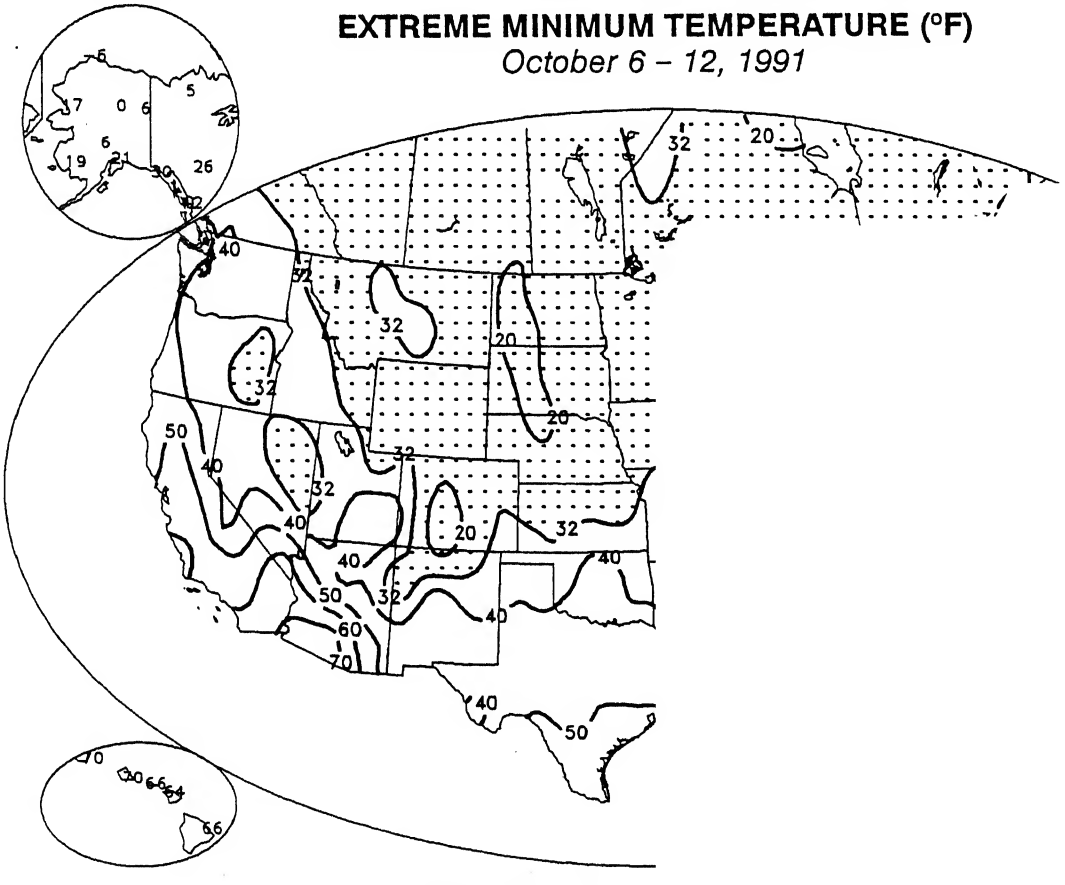
October 6 – 12, 1991



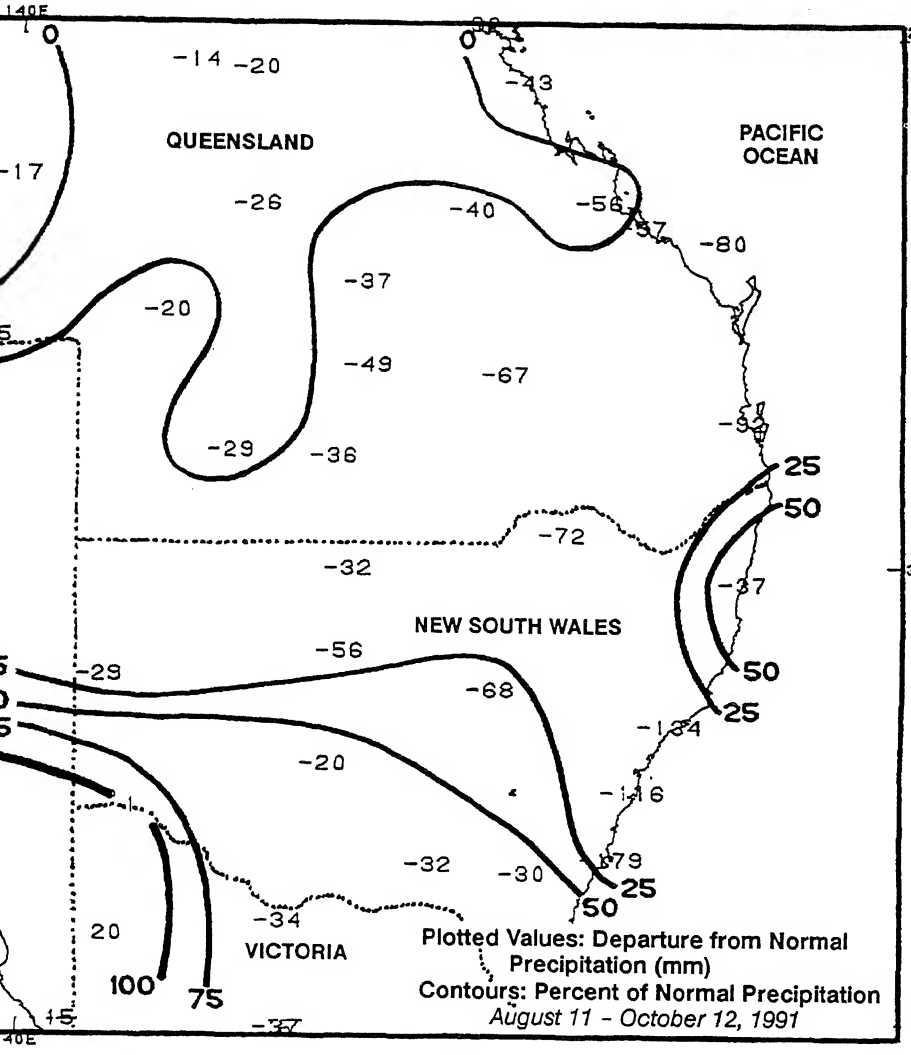
Unseasonably warm weather again dominated the Far West and moved into the Great Plains. Highs reached into the nineties as far north as southern Oregon and southern Nebraska (top). In contrast, unseasonable cool air settled into the eastern half of the nation, where temperatures dropped below freezing in the middle Mississippi Valley, southern Appalachians, and New England (bottom).

EXTREME MINIMUM TEMPERATURE (°F)

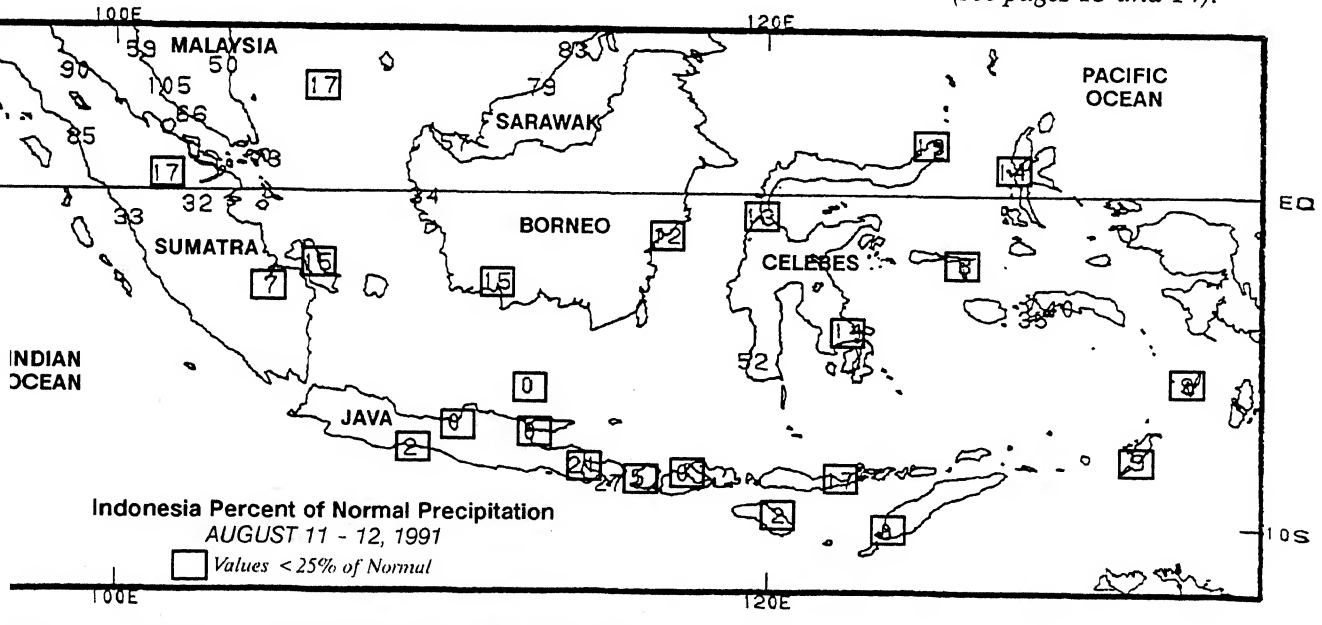
October 6 – 12, 1991



CLIMATE HIGHLIGHTS FEATURE

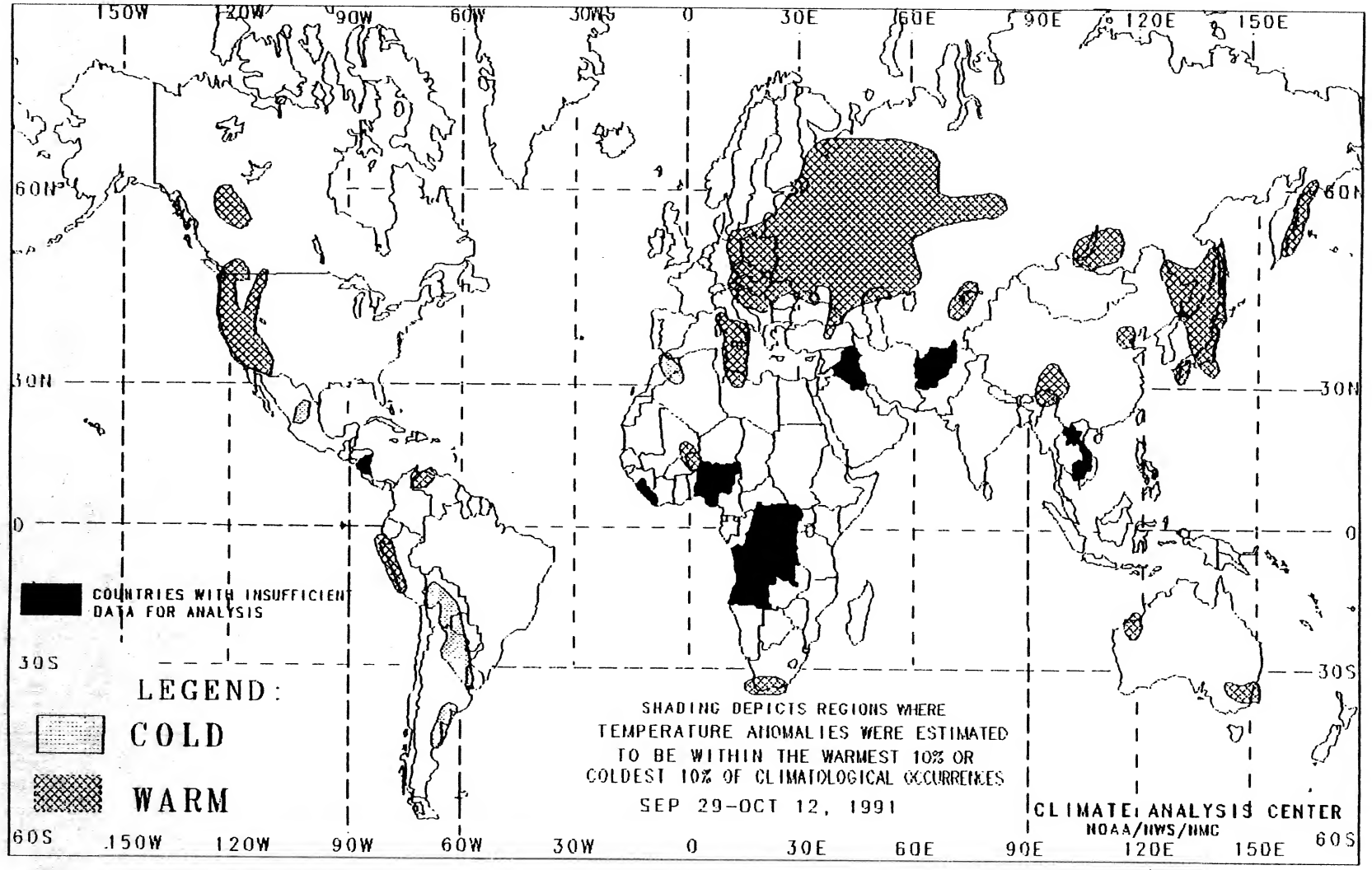


Exceptionally dry weather has prevailed across northern Queensland and northern New South Wales in Australia, where deficits exceeding 50 mm have accumulated during August 11 – October 12, 1991. Most of this region has received less than a fourth of normal rainfall during the period (left). Extremely dry conditions have also persisted across much of Indonesia during this period, where most locations have measured less than half of normal rainfall (bottom). Several stations on the islands of Sumatra and Java have moisture shortages exceeding 300 mm. The dry conditions have fueled wildfires on Sumatra and Borneo that have burned over 1,000 km^2 of rainforest, according to press reports. Both of these anomalies correlate well with expected weather patterns during an El Nino episode. A dry September – March period in these regions typically follows the Spring, Summer, or early Autumn development of abnormally warm waters in the Equatorial Pacific Ocean *(see pages 13 and 14).*



2–WEEK GLOBAL TEMPERATURE ANOMALIES

SEPTEMBER 29 – OCTOBER 12, 1991



The anomalies on this chart are based on approximately 2500 observing stations for which at least 13 days of temperature observations were received from synoptic reports. Many stations do not operate on a twenty–four hour basis so many night time observations are not taken. As a result of these missing observations the estimated minimum temperature may have a warm bias. This in turn may have resulted in an overestimation of the extent of some warm anomalies.

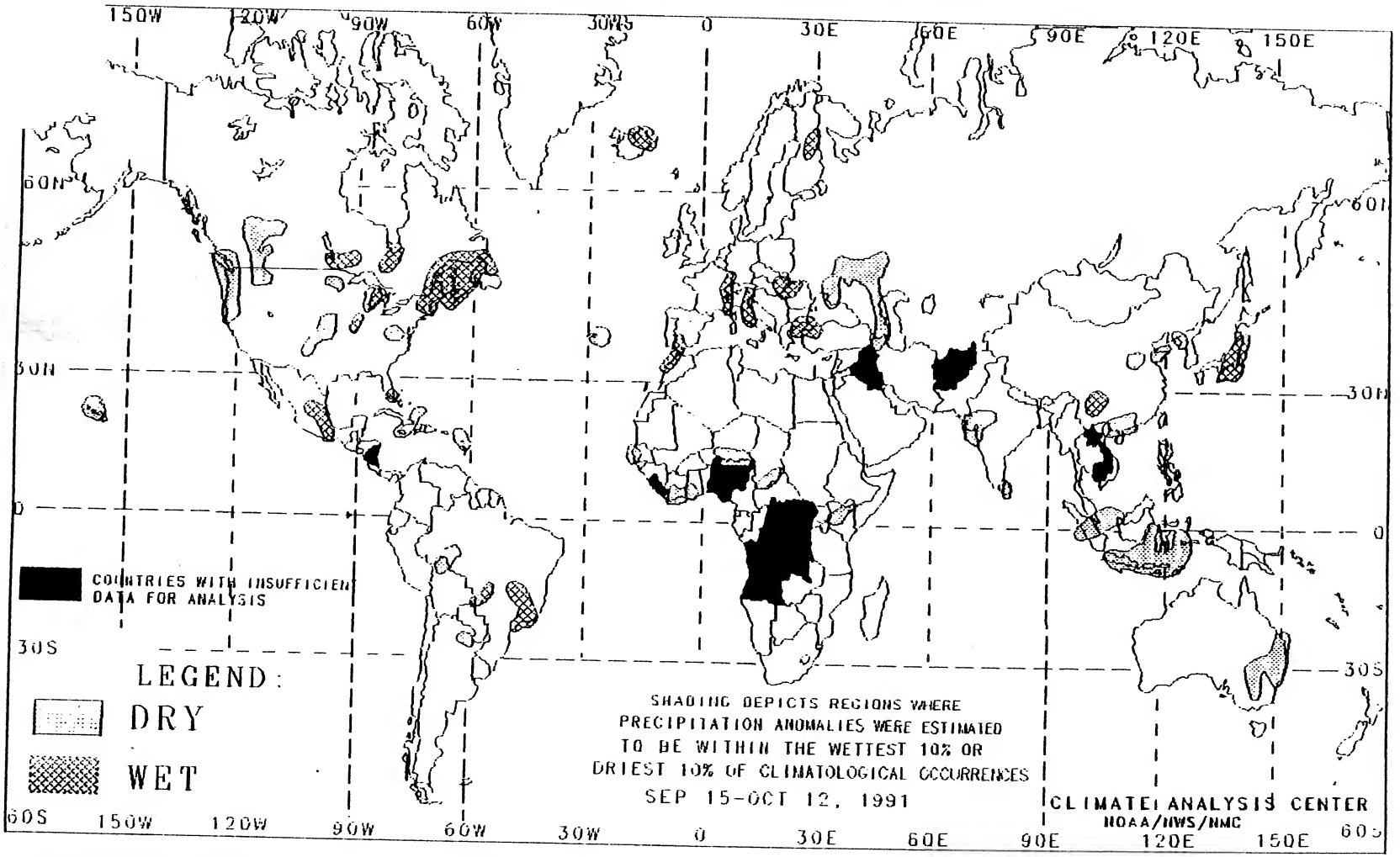
Temperature anomalies are not depicted unless the magnitude of temperature departures from normal exceeds 1.5°C.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

This chart shows general areas of two week temperature anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

4–WEEK GLOBAL PRECIPITATION ANOMALIES

SEPTEMBER 15 – OCTOBER 12, 1991



The anomalies on this chart are based on approximately 2500 observing stations for which at least 27 days of precipitation observations (including zero amounts) were received or estimated from synoptic reports. As a result of both missing observations and the use of estimates from synoptic reports (which are conservative), a dry bias in the total precipitation amount may exist for some stations used in this analysis. This in turn may have resulted in an overestimation of the extent of some dry anomalies.

In climatologically arid regions where normal precipitation for the four week period is less than 20 mm, dry anomalies are not depicted. Additionally, wet anomalies for such arid regions are not depicted unless the total four week precipitation exceeds 50 mm.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

The chart shows general areas of four week precipitation anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

SPECIAL CLIMATE SUMMARY
EL NIÑO/SOUTHERN OSCILLATION (ENSO
DIAGNOSTIC ADVISORY 91/06
issued by
DIAGNOSTICS BRANCH
CLIMATE ANALYSIS CENTER, NMC
OCTOBER 10, 1991

Oceanic and atmospheric anomaly patterns and tropical Pacific indices are consisten indicating a developing warm episode. In September, sea surface temperature (S anomalies were greater than +1°C in the equatorial Pacific near the date line, and along 5 and 5°S throughout most of the eastern Pacific (Fig. 1). This pattern of anomalies is q similar to that observed during the early stages of the 1986 – 1987 warm episode.

During the last two years, the warmest SSTs have gradually shifted eastward to near date line and SST anomalies have increased in the central and eastern equatorial Pacific (I 2). During the same period, low-level equatorial easterlies averaged weaker than normal tropical convective activity was slightly stronger than normal just west of the date line

In September, the Southern Oscillation Index (SOI) decreased to –1.8, the lowest va observed during the last 12 months, as negative sea level pressure anomalies dominated tropical eastern Pacific and positive anomalies prevailed over northern Australia Indonesia. the SOI has been negative for most of the last 12 months, and the five-mo running mean value centered on July 1991 was –1 (Fig. 3).

Between August and September 1991, the equatorial low-level easterlies weake substantially throughout the Pacific. This should result in the generation of eastw propagating oceanic Kelvin waves, which can be expected to reach the South Ameri coast within two months. These waves are generally associated with a deepening of oceanic thermocline and positive SST anomalies. We note, however, that additional peri of westerly anomalies (weakened easterlies) will be required in order to sustain th features should they develop.

An important feature of warm episodes is the development of enhanced convect along the equator in the vicinity of the date line. It is primarily the establishment of feature that results in the anomalous global-scale circulation and precipitation patte normally associated with warm (ENSO) episodes. As yet, only weakly enhanced convect has been observed in that region. If the convective activity in the central equatorial Pac increases and becomes persistent during the next two months, we can probably expect development of a full-fledged warm (ENSO) episode during the upcoming northern wi

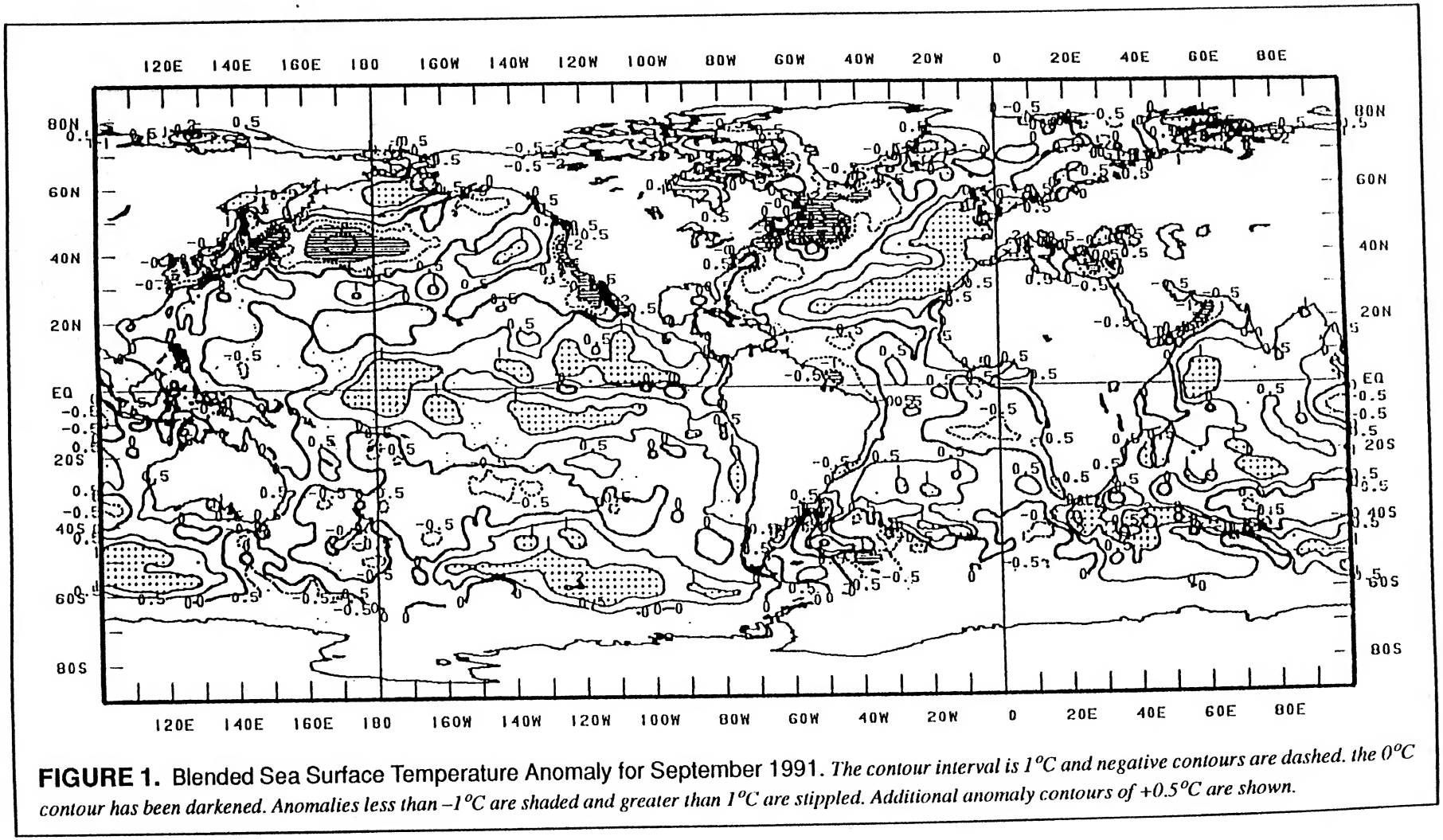


FIGURE 1. Blended Sea Surface Temperature Anomaly for September 1991. *The contour interval is 1°C and negative contours are dashed. the 0°C contour has been darkened. Anomalies less than –1°C are shaded and greater than 1°C are stippled. Additional anomaly contours of +0.5°C are shown.*

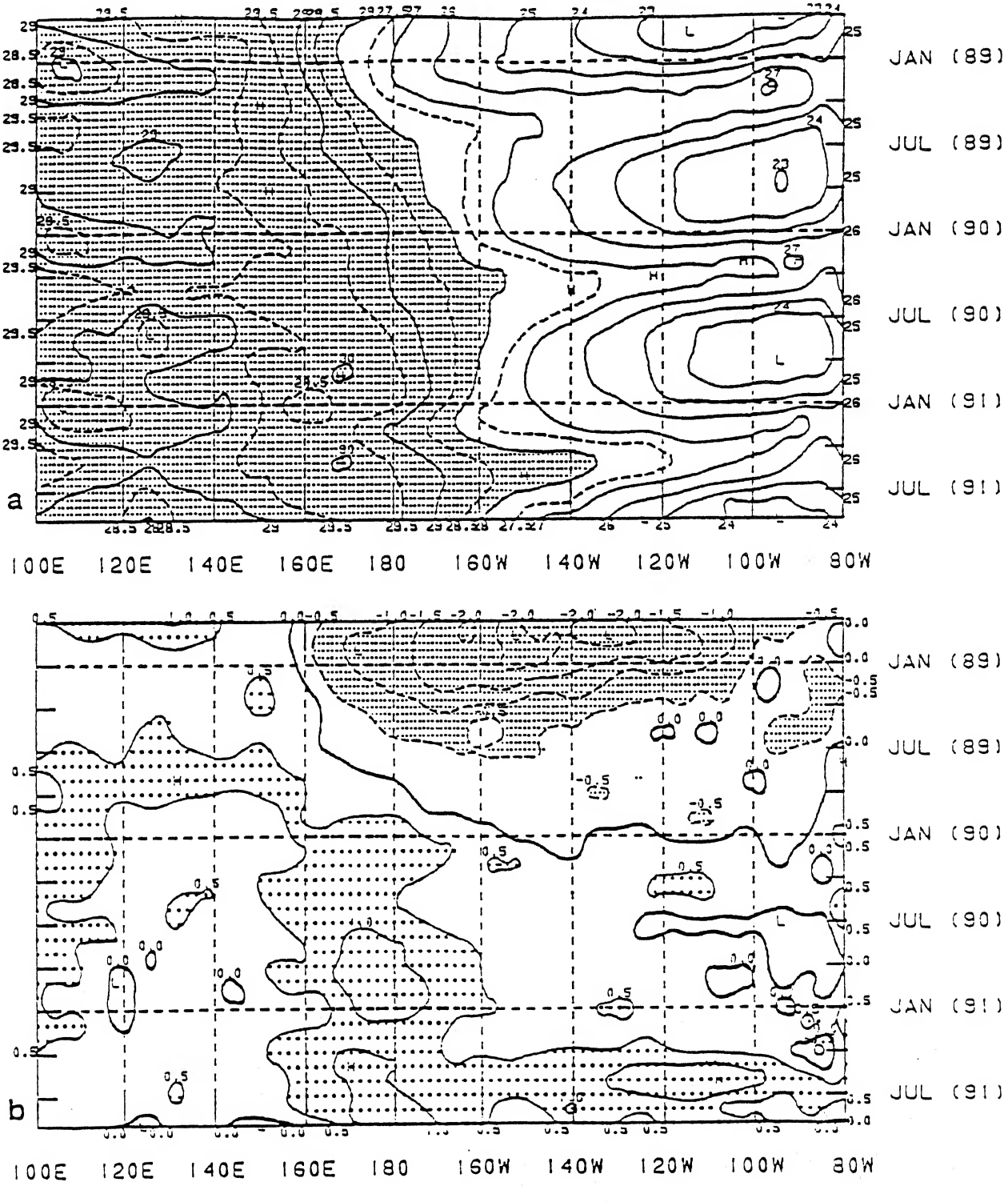


FIGURE 2. Time–Longitude Section of Monthly Sea Surface Temperature, a) Mean and b) Anomalous, for 5°N–5°S. *Contour interval is 1°C and 0.5°C, respectively. SST values greater than 28°C and anomalies less than –0.5°C are shaded. Stippled areas indicate anomaly values greater than 0.5°C. Anomalies are computed based on the COADS/ICE climatology* (Reynolds, 1988, *J. Climate*, 1, 75-76).

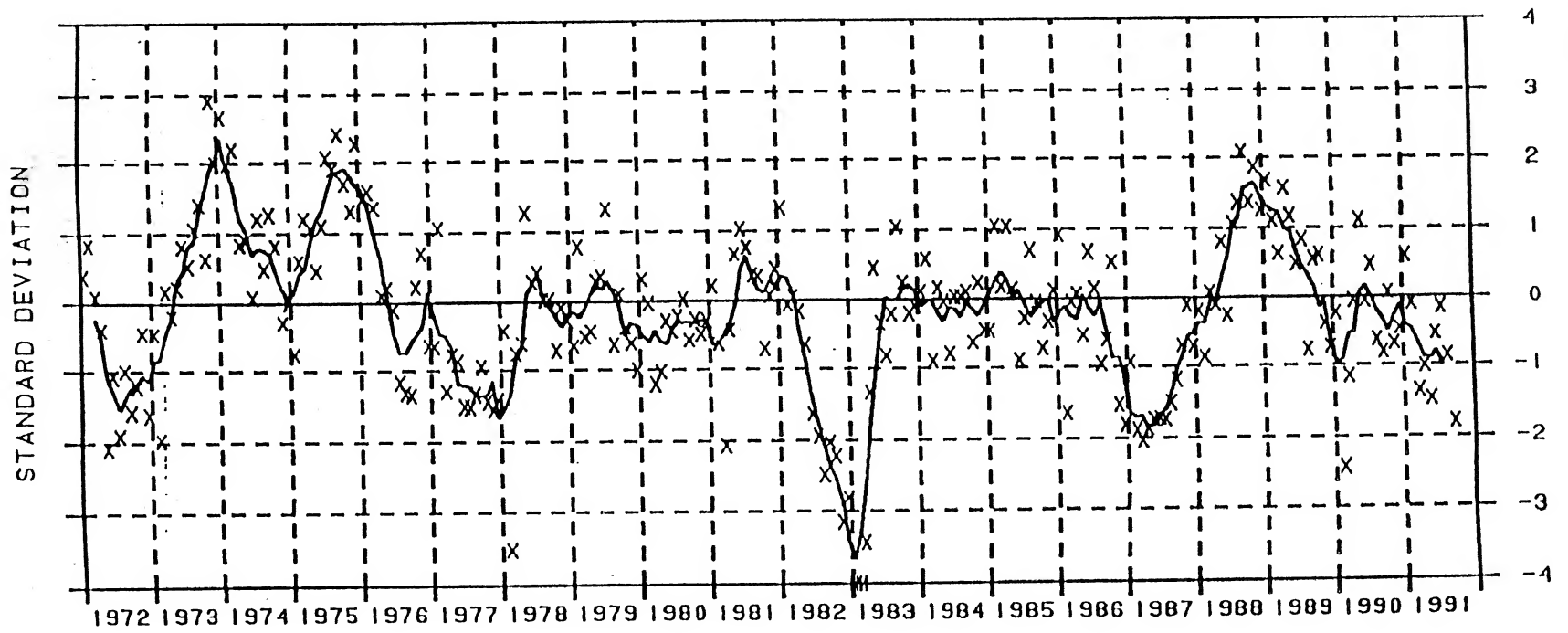


FIGURE 3. Five–Month Running Mean of the Difference Between the Standardized Sea Level Pressure Anomalies at Tahiti and Darwin (Tahiti minus Darwin). *Values are standardized by the mean annual standard deviation. Crosses are individual monthly means.*

EL NIÑO IN TROPICAL PACIFIC MAY AFFECT CLIMATIC CONDITIONS WORLDWIDE

The current "ENSO" (El Niño–Southern Oscillation) event, characterized by above normal sea surface temperatures, strong westerly wind flow at the surface, and strong easterly upper air (200 mb) circulation in the equatorial Pacific Ocean basin, are likely to be associated with climatic anomalies in several regions, as have previous ENSO events. Hence, there is considerable interest in identifying the onset of ENSO conditions and in monitoring its progress.

Past studies by Climate Analysis Center scientists C. Ropelewski and M. Halpert have already identified those regions where significant climatic responses to an El Niño are most likely (see publication list below). The results were obtained by statistical analysis of anomalous climatic conditions that occurred at the time of previous El Niño events. The maps (page 14) show the regions, the nature of the anomaly, and the most likely months of occurrence. Not every indicated anomaly occurs with every ENSO event. The very strong event of 1982–83 triggered a response in nearly all of the indicated regions. The weaker event currently underway has likely played a role in the occurrence of some recent climatic anomalies.

Scientists believe that an El Niño brings about large–scale climatic aberrations by adding extra heat from the warmer–than–normal ocean waters to the overlying atmosphere, thereby changing atmospheric circulation patterns to some extent. Since no two ENSO events are identical in every detail, it is not possible to predict the resulting disturbance of climatic conditions exactly. Research continues on the causes of ENSO events (and the l
[cold] phase of the Southern Oscillation [Ropelewski and Halpert, 1989]) and the
affect climatic conditions worldwide.

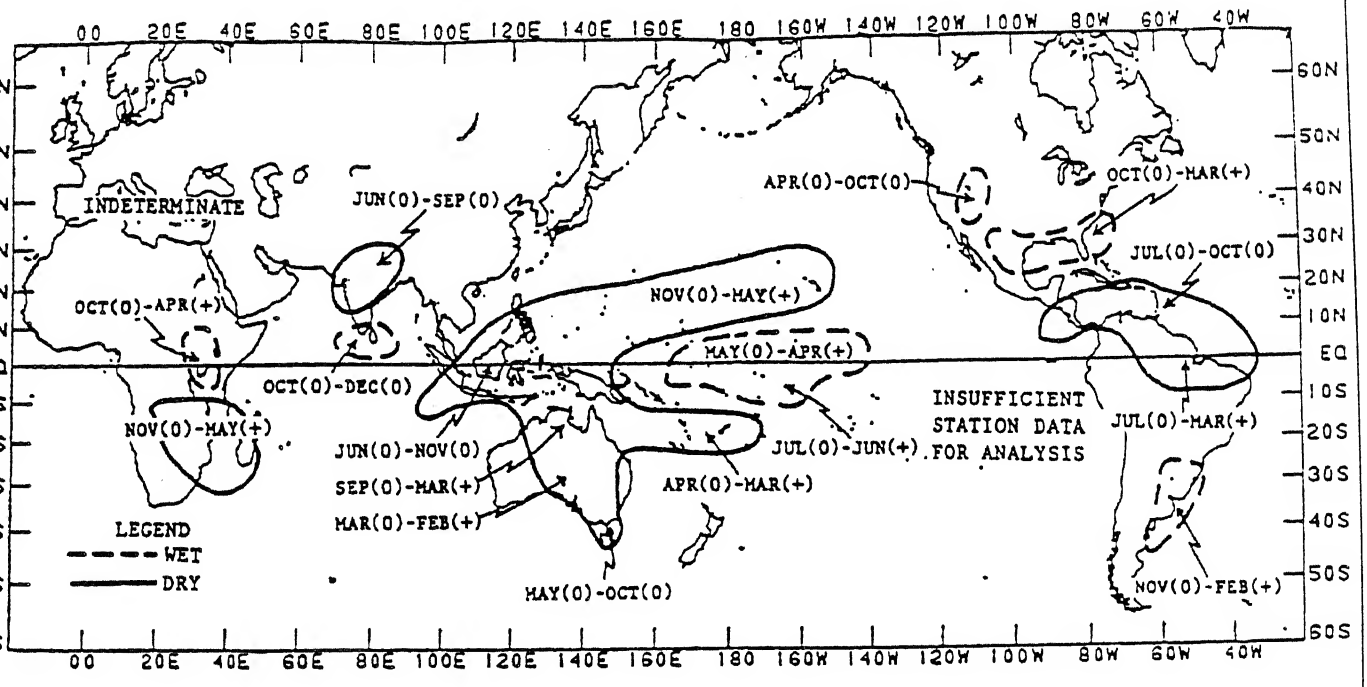
References:

Ropelewski, C.F. and M.S. Halpert, 1986: North American Precipitation and Temperature Patterns Associated with the El Niño/Southern Oscillation (ENSO). *Monthly Weather Review*, 114, 2352–2362.

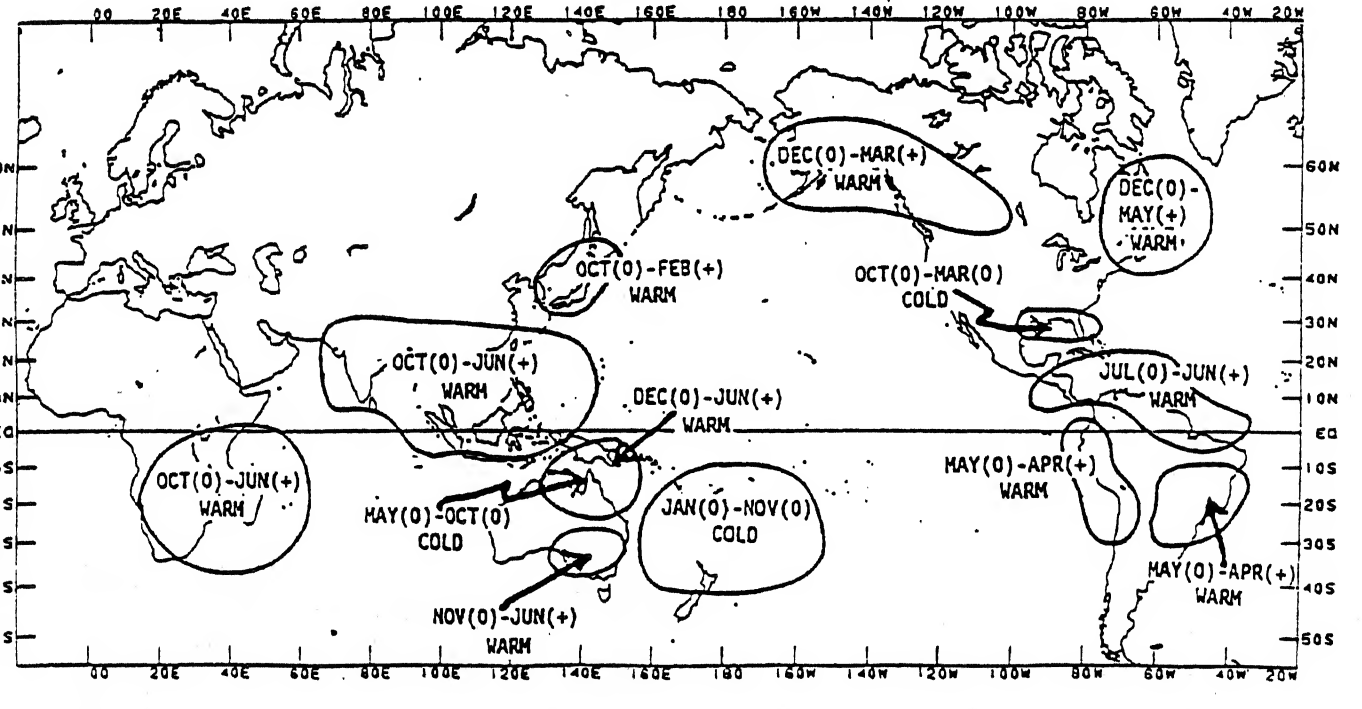
Ropelewski, C.F. and M.S. Halpert, 1987: Global and Regional Scale Precipitation Patterns Associated with the El Niño/Southern Oscillation. *Monthly Weather Review*, 115, 1606–1626.

Ropelewski, C.F. and M.S. Halpert, 1989: Precipitation Patterns Associated with the High Index Phase of the Southern Oscillation. *Journal of Climate*, 2, 268–284.

Halpert, M.S. and C.F. Ropelewski, 1991: Surface Temperature Patterns Associated with the Southern Oscillation. *Journal of Climate*, in press.



egions that are likely to experience anomalous precipitation (top) and temperature ottom) conditions during an ENSO (El Niño/Southern Oscillation) event. An "O" in arentheses after the month indicates the month of the same year as the ENSO event began; "+" indicates the following year. For the event currently in progress, "O" is 1991 and +" is 1992. For example, below normal temperatures between October 1991 – March 1992 re depicted as likely in the Gulf Coast region.



ATMOSPHERIC AND SEA SURFACE TEMPERATURE (SST) INDICES

DATE	SLP ANOMALIES		TAHITI–DARWIN SOI	PACIFIC 850 MB ZONAL WIND INDICES			PACIFIC 200 MB ZONAL WIND INDEX	OLR INDEX	PACIFIC SST					
	TAHITI	DARWIN		5N–5S 135E–180	5N–5S 175W–140W	5N–5S 135W–120W	5N–5S 165W–110W	5N–5S 160E–160W	NINO 1+2 0–10S 90W–80W		NINO 3 5N–5S 150W–90W		NINO 4 5N–5S 160E–150W	
SEP 91	–1.4	1.4	–1.8	–1.1	–1.1	–1.3	–0.4	–0.6	0.3	20.9	0.6	25.4	0.8	29.1
AUG 91	0.0	1.4**	–0.9**	–0.3	–0.2	0.2	0.7	–1.0	0.3	21.3	0.5	25.5	0.9	29.2
JUL 91	0.3	0.6	–0.2	–0.2	–0.5	–0.6	0.1	–0.2	0.9	22.6	1.0	26.6	0.9	29.4
JUN 91	0.1	1.0	–0.5	–0.3	–0.8	–1.1	–0.6	–0.1	0.4	23.2	1.3	27.6	0.8	29.3
MAY 91	–0.6	1.7	–1.5	–0.5	–0.7	–0.9	–1.2	–0.2	0.5	24.6	1.0	27.8	0.9	29.4
APR 91	–1.1	0.5	–1.0	–0.2	0.3	0.2	–0.6	–0.2	–0.3	25.2	0.4	27.6	0.8	29.1
MAR91	–0.1	2.1	–1.4	–0.9	0.1	–0.1	0.2	–0.2	0.5	26.7	0.3	27.2	0.5	28.6
FEB 91	0.0	0.1	–0.1	0.4	0.3	0.9	–0.1	–0.6	0.5	26.2	0.2	26.5	0.7	28.7
JAN 91	1.0	0.1	0.6	0.5	0.3	0.1	0.1	–0.3	0.0	24.3	0.4	25.8	0.8	28.9
DEC 90	–0.3	0.4	–0.5	–0.6	–0.6	–0.6	–0.8	–0.3	0.0	22.5	0.2	25.3	1.0	29.2
NOV 90	–0.7	0.4	–0.7	–1.7	–0.3	0.1	0.0	–0.1	–0.1	21.4	0.0	25.0	0.8	29.1
OCT 90	0.4	0.3	0.1	0.5	–0.2	–0.4	–0.4	0.2	–0.4	20.4	0.2	25.0	0.8	29.2

* PRELIMINARY

** REVISED

Atmospheric and SST index values for the most recent 12 months. Atmospheric indices are standardized by the mean annual standard deviation except for the Tahiti and Darwin SLP anomalies which are in mb. SST indices (anomalies and means) are in degrees Celsius. Note that positive (negative) values of the 200 mb Zonal Wind Index imply westerly (easterly) anomalies; positive (negative) values of the 850 mb Zonal Wind Indices imply easterly (westerly) anomalies.